MCM Systems for Littoral Combat Ship Advanced Flight Mission Package Industry Day Brief

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Sam Taylor, Ph.D.
ONR Product Line Manager

Revolutionary Research . . . Relevant Results

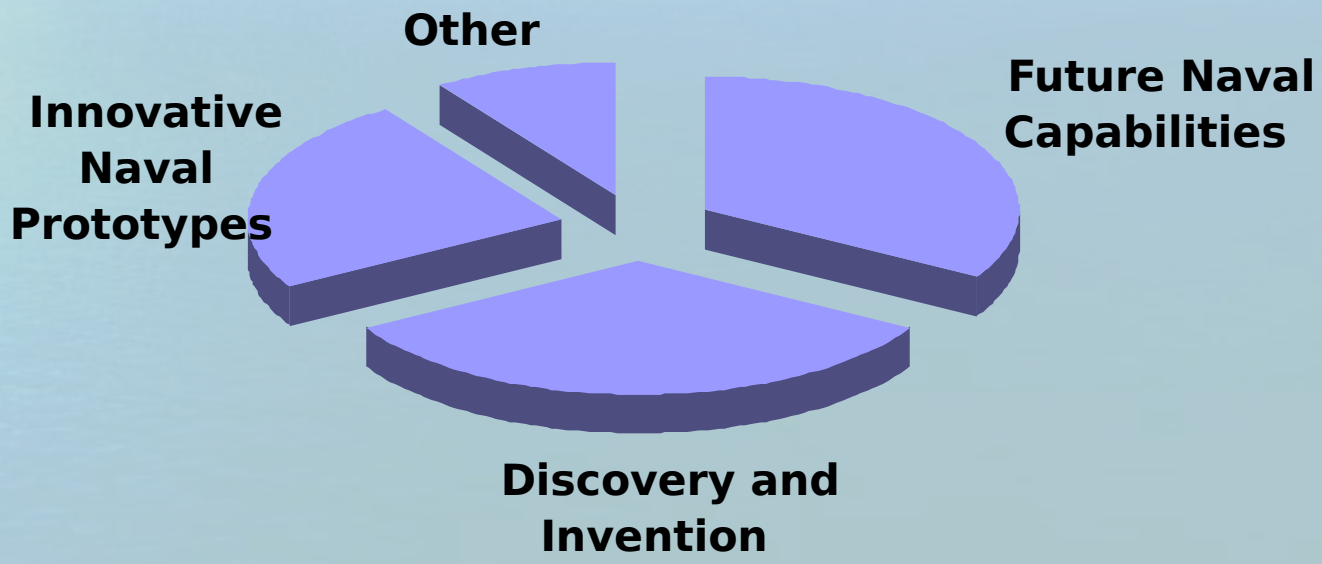
Outline

- Review of ONR S&T portfolio
- Future Naval Capabilities and Transition
- LCS MIW Mission Package Manning Challenges
- Broad Agency Announcement 07-023
- Opportunities
- BAA Schedule

ONR Mission Statement

"*To foster, plan, facilitate and transition <u>scientific research</u> in recognition of its paramount importance to enable future naval power and the preservation of national security.*"

ONR S&T Portfolios



***D&I* – Basic Research and early exploratory development**
FNC – Product delivery with target acquisition program and sponsor
***INP* – Prototype development without necessarily having a target acquisition program**
***Other* – OSD Directed**

hip Advanced Flight Mission Packa

Future Naval Capabilities

- Sea Shield
- Sea Strike
- Sea Basing
- FORCEnet
- Enterprise and Platform Enablers
- Sea Warrior

Best technology solutions to stated OPNAV requirements by bundling discrete but interrelated S & T products that deliver a distinctly measurable improvement within a five-year time frame.

Future Naval Capabilities

- FNCs are broken down into distinct enabling capabilities (EC) that address certain warfighting gaps identified by OPNAV
- Each EC is composed of distinct product lines that, when bundled together, deliver a capability that fills the gap.
- Designed to bridge the technology valley of death

Transition

- The metric used to determine the successful delivery of the measurable improvement is Transition.
- What make up a Transition?
  - S&T delivers mature products to acquisition for development and production program
  - S&T Product Transition occurs when exit criteria is met and the acquisition program office commences integration efforts
  - Technology Transition Agreement (TTA) is signed on the acceptable product maturity and readiness (Technology Readiness Level). TTA is signed by the resource sponsor, acquisition sponsor, and ONR.

Technology Readiness Levels

DOD DESKBOOK 5000.2-R – (Appendix 6)

Technology Readiness Level	Description
4. Component and/or breadboard validation in laboratory environment.	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in the laboratory.
5. Component and/or breadboard validation in relevant environment.	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so it can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components.
6. System/subsystem model or prototype demonstration in a relevant environment.	Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high-fidelity laboratory environment or in simulated operational environment.

MCM Capacity Spiral 2 SHD-FY07-01

- Sea Shield FY07 New Start EC running through FY11
- Composed of 5 product lines that focus on the capability to clear large areas of mines
- Only product line that specifically addresses LCS MIW Mission Package Technology issues

MCM Systems for LCS Product Line

- Enhanced MIW Mission Package that uses advanced, autonomous, unmanned MCM systems (USV, UAV, UUV) for advanced flight Littoral Combat Ship
- Focused on reduction of manning requirements through
  - Task automation and expert systems
  - Development of autonomy framework for all areas of mission execution
  - Reduction of mission timelines through the use of unmanned systems throughout mission execution (UUV/USV/UAV)

Mission Package Defined

Revolutionary Research . . . Relevant Results

{Mission Systems} + Support Equipment = {Mission Modules} + Crew & Support Aircraft = Mission Package

Vehicles
- RMMV
- USV

Weapons
- RAMICS
- AMNS
- NLOS LS

Sensors
- ALMDS
- UDS
- AQS20A
- OASIS
- USSS

+

Support Containers

Support Equipment

Standard Interfaces

Mission Package Computing Equipment (MPCE) Software

+

VTUAV

Mission Crew

H-60

=

MPCE Hardware

Focused Mission Capability
Mine Warfare (MIW)

Revolutionary Research . . . Relevant Results

Mine Warfare Alpha Modules (Baseline)	
Mission Systems	Unmanned Surface Vehicle (x1) Unmanned Surface Sweep System (x1) Remote Multi Mission Vehicle (x2) Organic Air and Surface Influence System (x1) Airborne Mine Neutralization System (x1) Airborne Laser Mine Detection System (x1) AN/AQS-20A (x3) Rapid Airborne Mine Clearance System (x1)
Other	Coastal Battlefield Reconnaissance & Analysis (x2) Support Equipment

Unmanned Surface Vehicle

Oregon Iron Works

Vertical Takeoff Tactical Unmanned Arial Vehicle

Northrop Grumman

Remote Multi Mission

Lockheed Martin

MH60S

Sikorsky

Unmanned Surface Sweep System

EDO

Coastal Battlefield Reconnaissance sis

Northrop Grumman

AN/AQS-20A

Raytheon

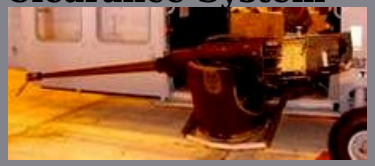
Airborne Laser Mine Detection

Northrop Grumman

Airborne Mine Neutralization

Raytheon

Rapid Airborne Mine Clearance System

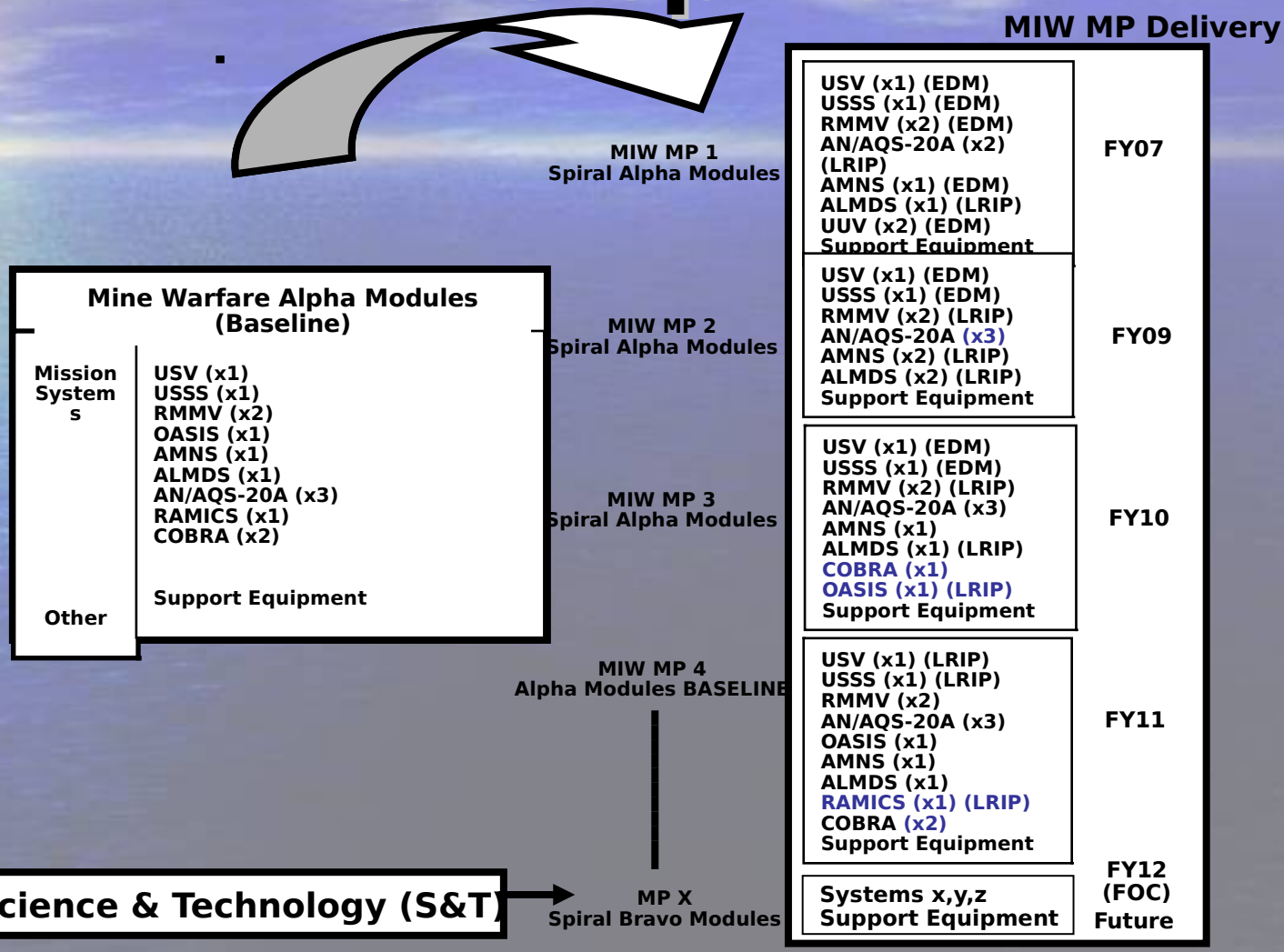


Northrop Grumman

Organic Air & Surface Influence

EDO

MIW MP Spiral Development



FLEXIBILITY TO RESPOND TO THE CHANGING THREAT

Manning Challenges

- Independent mission package and sea frame development
- Sea frame, mission package integration
- Manning Goal (75 crew)
  - 40 core crew
  - 20 aviation detachment
  - 15 watercraft detachment
- Shift length/rotation
- Launch and recovery process and environment
- Ship motion: illness and injury
- System immaturity
- Human error
- Training proficiency/ ability to retain
- Command and Control

Mandated Manning = 15

HSI Analysis = 19-27

MIW Watercraft Mission Modules

- Unmanned Surface Vehicle (USV)
  - Sea Type 1 Module
    - USSV
    - USSS
    - USV cradle
  - USV Support Module
    - System Support Module
    - USV Support Equipment Loadout
- Battlespace Preparation Autonomous Underwater Vehicle (BPAUV)
  - System Support Module
  - BPAUV UUV (2)
  - BPAUV Support Equipment Loadout

MIW Watercraft Mission Modules

- Remote Minehunting System (RMS)
  - Sea Type 2 Module (1-2)
    - Remote Multi-mission Vehicle (RMMV)
    - Capture Spine
    - Cradle Pallet Assembly
  - RMS Support Module
    - System Support Module
    - RMS Support Equipment Loadout
    - VHTE
  - AQS-20 Support Module
    - System Support Module
    - AN/AQS-20A (RMS) (1-2)
    - AQS-20A Support Equipment Loadout

LCS Operations

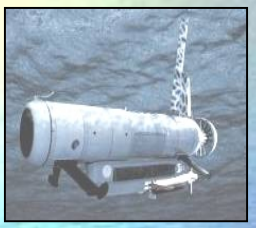
- Pre-launch
  - High level tasking
  - Vehicle preparation
  - Payload configuration
  - Mission Planning
  - Simulation/Validation
  - Data Management
- Launch
  - Handling
  - Safety
  - Monitoring status
  - Autonomy
  - Data Management
- Transit to Op Area
  - Monitoring status
  - Autonomy
  - Data Management
- Execution
  - Monitoring status
  - Re-tasking
  - Autonomy
  - Data Management

LCS Operations

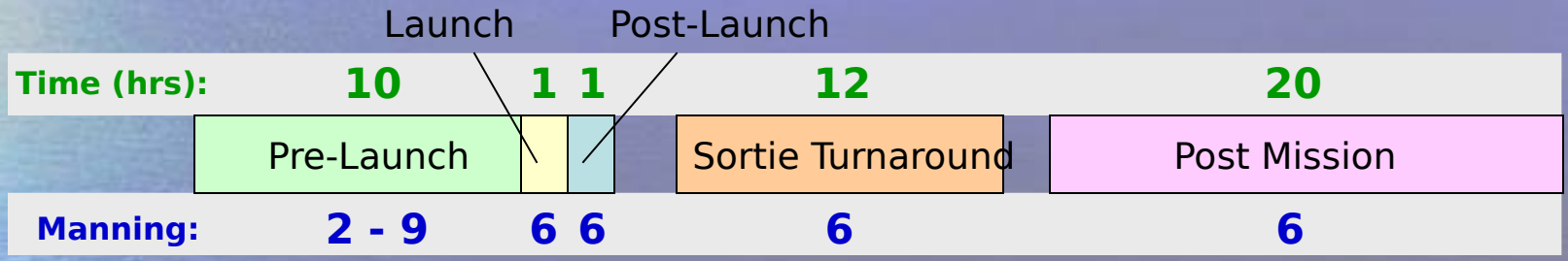
- Recovery
  - Handling/Safety
  - Monitoring status
  - Autonomy
  - Data Management
- Post-Recovery
  - Handling/Safety
  - Monitoring status
  - Diagnostics
  - Data extraction
  - Data Management
  - Analysis

Notional Littoral Combat Ship (LCS) Mission Cycles - RMS

RMS



Weight:~15,000 lbs.
Size: 23’ L x ~4’ W x ~7’ H
(excl. mast)



- Equipment Prep.
- Load Sonar
- Position Vehicle
- Launch Prep.

- Recovery
- Fuel
- Launch

- Recovery
- Post Mission Ops.

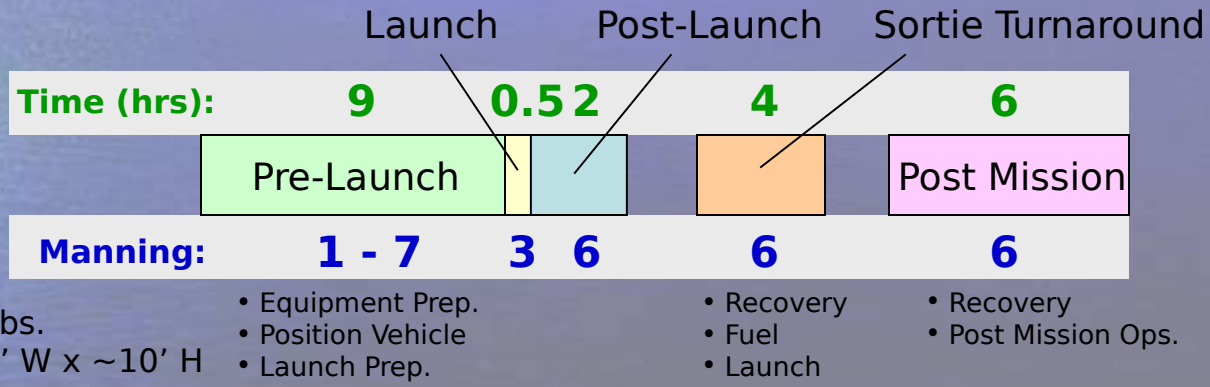
Minimum operator - 1
PMA Performed on 1:1 basis

Reference: Ops Sequence Document

Notional Littoral Combat Ship (LCS) Mission Cycles - USV

USV

Weight:~25,000 lbs.
Size: 39’ L x 11’ W x ~10’ H



- Equipment Prep.
- Position Vehicle
- Launch Prep.

- Recovery
- Fuel
- Launch

- Recovery
- Post Mission Ops.

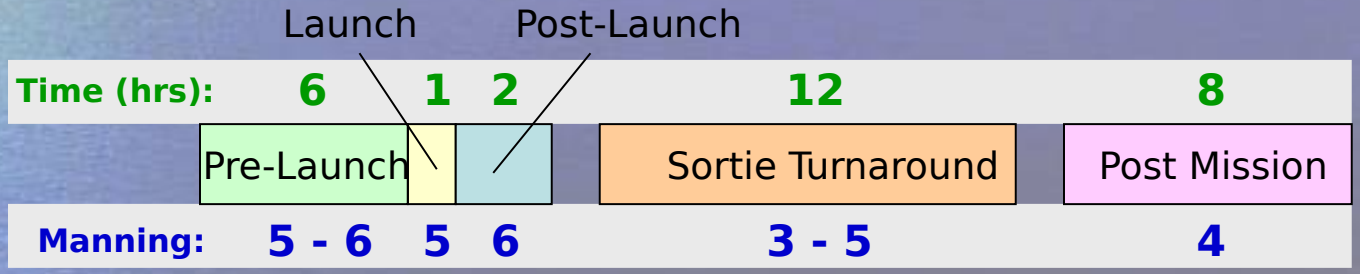
Minimum operator - 1
PMA Performed on 1:1 basis

Reference: Ops Sequence Document

Notional Littoral Combat Ship (LCS) Mission Cycles - BPAUV

BPAUV

Weight: ~750 lbs.
Size: 10’ L x 21” D



- Equipment Prep.
- Position Vehicle
- Launch Prep.

- Recovery
- Turnaround Vehicle
- Launch

- Recovery
- Post Mission Ops.

Minimum mission operators – 1 (No real-time acoustic data)
PMA Performed on 1:1 basis

Reference: Ops Sequence Document

BAA 07-023

- Advance the capabilities of the war fighter as well as the technologies employed for MCM. The thrust of the effort is to integrate the MIW Mission Package crew and systems in innovative ways, to minimize or eliminate system employment inefficiencies, and to optimize the tactical performance of the limited crew.

Module Automation Technologies

- Automated mission system maintenance
- Self-diagnosing, self-healing software
- Enhanced mission system reliability
- Automated mission deck operations (e.g., High speed Launch and Recovery)
- Automated pre-mission preparation

Limited Operator-in-the-Loop Operations

- Automated tactical decision aids and information displays
- Automated/Adaptive mission planning
- Automated mission monitoring/ Virtual Watchstander
- Automated Post Mission Analysis
- Offboard processing under limited payload/power/bandwidth conditions

Modular Architecture for Autonomous Operations

- Interfacing standards for autonomous operations
- Architecture for rapid technology insertion

Program Breakdown

- Two Phases
  - Phase 1 – 18 months
    - Focus on sub-system development
    - Conclude with demonstration
  - Phase 2 – 30 months
    - Integration of sub-systems into MCM system for demonstration at Fleet or Sea Trial event.
- Phase 2 will be solicited via separate call in late FY08/early FY09
- Phase 1 Award
  - Available Funds: $12M
  - Award Range: $500k - $3M
- Number of Phase 1 awards: 6 – 12

Evaluation Criteria

- Overall scientific and technical merits of the proposal.
- Naval relevance, transition potential** and anticipated contributions of the proposed scientific research.
- Offeror's capabilities, related experience, and past performance, including the qualifications, capabilities and experience of the proposed team (including principal personnel).
- The realism of the proposed cost.
- For proposed awards to be made as contracts to large businesses, the socioeconomic merits of each proposal will be evaluated based on the extent of the Offeror's commitment in providing meaningful subcontracting opportunities for small businesses, small disadvantaged businesses, woman-owned small businesses, HUBZone small businesses, veteran-owned small businesses, service disabled veteran-owned small businesses, historically black colleges and universities, and minority institutions.

**nsition Potential is aided by the availability of government use rights a
a Modular Open Systems Approach to the technology development**

Teaming

- ONR highly encourages teaming of Industry with Academia and Industry with Government
- Takes advantages of strengths and experience
- Maximizes innovation

ONR Modular Mission Packages

- ONR has developed prototype Unmanned Underwater Vehicle (UUV) Mission Modules.
- Modules have been deployed for Fleet Battle Experiments and technology demonstrations
- Employed in numerous unmanned system experimentation trials.
- Incorporate advanced UUV system technologies and state-of-the-art processing algorithms
- Operated and evaluated by a trained cadre of Fleet sailors
- This will provide a platform for demonstration of any new technologies

ONR Modular Mission Packages

ONR Modular Mission Packages

- 4 modules
  - 1 BPAUV Module (4 BPAUV)
  - 1 REMUS Module (6 REMUS)
  - 1 Hybrid Module (Combination)
  - 1 PMA module
- Experimental and Demonstration Testbed for ONR UUV Mission Module Technologies since 2003
- Self-contained modules
  - Mission Planning
  - Maintenance
  - Mission Execution
  - Computing/Process
- Experienced group of operators with set of advanced UUVs
- Provides a possible testbed for new advanced module concepts and platform for demonstration
- Modules reside at Naval Surface Warfare Center Panama City

Sea Fighter

- Provides a platform to conduct at-sea, operationally relevant science and technology experiments
- Capability to collect and evaluate data and assess performance of advanced developmental programs.
- Primary research, development, testing and evaluation sites for littoral combat ship (LCS) developmental technologies.
- Home-ported at Naval Support Activity Panama City

Schedule

Event	Date	Time (Eastern)
Industry Day	17 April 2007	
White Papers Due	17 May 2007	1600
Notification of Evaluations	15 June 2007	
Full Proposal Due Date	17 July 2007	1600
Oral Presentations	TBD	
Notification of Selection for Award	24 August 2007	
Contract Awards	1QFY08	
Kickoff Meeting	3 weeks after award	

Contact Information

Technical POC:

Dr. Sam Taylor

(850) 234-4066

james.s.taylor@navy.mil

Business POC:

Ms. Ellen Simonoff

(703) 696-0157

simonoe@onr.navy.mil

http://www.onr.navy.mil/02/baa/07_023

Revolutionary Research . . . Relevant Results

Please put your questions on the index cards provided.

Answers will also be posted to:
http://www.onr.navy.mil/02/baa/07_023

Questions

1. Will LCS interface specs be available to proposers?
2. Is the documentation of LCS HSI reference be available?
3. Will new technology be considered if it can be matured within 5 yrs?
4. In your notional LCS mission cycle for RMS actually in the water? Same question for USV and BPAUV?
5. Are you looking for solutions only geared toward POR for LCS or is there opportunity to introduce new systems to augment current system capabilities and satisfy your desires to reduce manning?
6. What is the range/scope of sub-system? Can it be software?
7. Mike mentioned ASTM standards as the means to establish requirements now for future technologies. Are sufficiently mature? Are there comparable standards for other vehicles?
8. Can you share current L&R of vehicle/sensor movement steps through mission bay?
9. Can we publish ICDs?
10. Are concepts that address improvements to current MIW mission systems acceptable under this BAA?
11. Would there be any interest in a capability to better understand the environment to enhance overall MIW ops?
12. Vehicle L&R is in court of SaeFrame developers. Does this preclude proposed concepts for L&R under this BAA?
13. Does the white paper and proposal need to address phase 2 in order to identify the potential product for FY11
14. Will there be any GFI be made available such as MPCE design and interfaces?
15. What is the TRL level expected at the end of Phase 1?
16. Provide a concise description of what is wanted.

Questions

1. Should contractors include costs for government facilities and operational SME or will they be separately funded?
2. How do you envision sharing these technologies with other Navy applications- Beyond LCS and Beyond MCM?
3. Will ICD, CONOPS, and Req Docs for prototype mission modules and X-craft interfaces be made available? If so, when?
4. Same question for ICD for MCM
5. Where does UVCC (JUSC2 Product) play? Is it embodied in the MPCE?
6. Mentioned significant ONR GFE associated w/UUVs. Are there similar modular mission packages to support VTUAV and the aviation-centric capabilities?
7. Are UUVs networked and coordinated? Should we assume mission package addresses coordinated UUVs?
8. What are the key performance metrics for phase 1 demonstration?
9. Can the ICD for the MM be provided?
10. How many and what type of MIW can be co-located on the LCS?
11. Deconflict with capable manpower FNC?
12. Does NG have to be inlcuded on team?
13. Difference between sub-system and system?
14. TRL for start?
15. What should transition plan be for Phase 1?
16. How much coverage do you expect in the proposals?